

What is claimed is:

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1. A protection circuit of a field effect transistor for protecting a gate electrode of the field effect transistor against surge breakdown, comprising:

a diode array in which a plurality of forward direction first diodes and reverse direction second diodes, the number of which is equal to that of the first diodes, are cascade-connected,

wherein a gate electrode of the field effect transistor is grounded through the diode array.

2. A protection circuit of a field effect transistor according to claim 1, wherein the diode of the diode array is formed as a Schottky barrier diode made of an n⁺-type layer having a high doping concentration and a Schottky electrode provided on the n⁺-type layer, or a pn junction diode in which a pn junction with an n⁺-type layer having a high doping concentration is made.

3. A protection circuit of a field effect transistor according to claim 1, wherein the number of the forward direction first diodes of the diode array is determined so that a leak current of the protection circuit becomes not larger than a leak current value of maximum rating of the gate electrode required for the field effect transistor.

4. A protection circuit of a field effect transistor

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according to claim 1, wherein the field effect transistor is one selected from the group consisting of a junction field effect transistor, a Schottky barrier gate field effect transistor, and a hetero junction field effect transistor, and the diode is constructed as a compound semiconductor element formed integrally with the field effect transistor on a compound semiconductor substrate.

5. A semiconductor device comprising a protection circuit for protecting a gate electrode or a drain electrode of a field effect transistor against surge breakdown, wherein

the protection circuit includes a plurality of diodes connected to the gate electrode or the drain electrode in a forward direction, and a plurality of diodes connected to the gate electrode or the drain electrode in a reverse direction.

6. A semiconductor device according to claim 5, wherein the semiconductor device is formed on a compound semiconductor substrate.

7. A semiconductor device according to claim 6, wherein the compound semiconductor substrate is made of GaAs.

8. A semiconductor device according to claim 5, wherein the diode includes a first impurity introduction layer formed in a substrate, and a Schottky electrode formed on the first impurity introduction layer and Schottky-connected to the first impurity introduction layer.

9. A semiconductor device according to claim 5, wherein

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the diode includes a first conductivity type first impurity introduction layer formed in a substrate and a second conductivity type second impurity introduction layer provided opposite to the first impurity introduction layer.

10. A semiconductor device according to claim 5, wherein the field effect transistor is a junction field effect transistor.

11. A semiconductor device according to claim 5, wherein the field effect transistor is a Schottky barrier gate transistor.

12. A semiconductor device according to claim 5, wherein the field effect transistor is a hetero junction field effect transistor.

13. A semiconductor device comprising a protection circuit for protecting a gate electrode of a field effect transistor against surge breakdown, wherein

the protection circuit includes a first diode having an anode connected to the gate electrode, a second diode having a cathode connected a cathode of the first diode, a third diode having an anode connected to an anode of the second diode, and a fourth diode having a cathode connected to a cathode of the third diode.

14. A semiconductor device comprising a protection circuit for protecting a gate electrode of a field effect transistor against surge breakdown, wherein

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the protection circuit includes a first diode having a cathode connected to the gate electrode, a second diode having an anode connected to an anode of the first diode, a third diode having a cathode connected to a cathode of the second diode, and a fourth diode having an anode connected to an anode of the third diode.

15. A semiconductor device comprising a protection circuit for protecting a gate electrode of a field effect transistor against surge breakdown, wherein

the protection circuit includes a first diode unit made of a plurality of diodes in which a cathode or an anode is connected to the gate electrode, and a second diode unit made of a plurality of diodes in which an anode or a cathode is connected to the anode or the cathode of the first diode unit.

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